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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,743	02/09/2004	Andrei Starodoumov	COHV-5250	9208

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EXAMINER

DIACOU, ARI M

ART UNIT	PAPER NUMBER
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3663

DATE MAILED: 09/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/774,743

Applicant(s)

STARODOUMOV, ANDREI

Examiner

Ari M. Diacou

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 15-22 and 25-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14, 23 and 24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-27 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2-9-2004.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. 20050907.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election / Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-14 and 23-24 drawn to pump radiation routing, classified in class 359, subclass 341.32.
 - II. Claim 15-18, drawn to pump optical fiber composition, classified in class 359, subclass 341.5.
 - III. Claims 19, drawn to pumping with multiple sytems, classified in class 359, subclass 341.33.
 - IV. Claims 20-22, drawn to a method of pump radiation routing, classified in class 359, subclass 341.32.
 - V. Claims 25-27, drawn to amplifier operation in an optical transmission system, classified in class 398, subclass 37.

2. During a telephone conversation with Michael Stallman on 9-7-2005 a provisional election was made without traverse to prosecute the invention I, drawn to claims 1-14 and 23-24. Affirmation of this election must be made by applicant in replying to this Office action. Claims 15-22 and 25-27 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

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3. Inventions IV and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the method can be practiced on an apparatus that uses a circulator instead of a recovery fiber in order to reintroduce unused pump light.

4. Inventions IV and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the method can be practiced on an apparatus that uses a circulator instead of a recovery fiber in order to reintroduce unused pump light.

5. Inventions IV and III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the method can be practiced on an apparatus that uses a circulator instead of a recovery fiber in order to reintroduce unused pump light.

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6. Inventions IV and V are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the method can be practiced on an apparatus that uses a circulator instead of a recovery fiber in order to reintroduce unused pump light.

7. Inventions I and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination (invention I) can use a laser diode as a pump source instead of invention II. The subcombination has separate utility such as an amplifier in medical applications.

8. Inventions I and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination (invention I) can

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use a laser diode as a pump source instead of invention III. The subcombination has separate utility such as an amplifier in medical applications.

9. Inventions V and I are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination (invention V) can use a laser diode as a pump source instead of invention I. The subcombination has separate utility such as an amplifier in medical applications.

10. Inventions II and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination (invention II) can use a laser diode as a pump source instead of invention III. The subcombination has separate utility such as an amplifier in medical applications.

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11. Inventions V and II are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination (invention V) can use a laser diode as a pump source instead of invention II. The subcombination has separate utility such as an amplifier in medical applications.

12. Inventions V and III are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the combination (invention V) can use a laser diode as a pump source instead of invention III. The subcombination has separate utility such as an amplifier in medical applications.

13. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Claim Rejections - 35 USC § 102

14. Claims 1, 4-8, 13-14, and 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Nilsson et al. (USP No. 6288835).

- Regarding claim 1, Nilsson discloses an optical apparatus, comprising:
 - an amplifier fiber having a doped core surrounded by a cladding, [Fig. 19, #1408] [Col. 32, line 61 - Col. 33, line 24]
 - said core doping providing optical gain for light propagating therein in a propagation direction when said doped core is energized by pump light absorbed therein; [Fig. 19, #1408] [Col. 32, line 61 - Col. 33, line 24]
 - and an optical arrangement for inserting pump-light from a source thereof into said cladding of said amplifier fiber such that said pump light propagates in said cladding thereof in said propagation direction; [Fig. 19, #1902] [Col. 32, line 61 - Col. 33, line 24] and
 - at least one recovery fiber for receiving an unabsorbed portion of said propagated pump light from said cladding and for re-inserting said unabsorbed portion of said pump-light into said cladding for re-propagation therein. [Fig. 19, #1901] [Col. 32, line 61 - Col. 33, line 24]
- Regarding claim 4, Nilsson discloses the apparatus of claim 1, wherein said recovery fiber is arranged to couple pump light out of said amplifier cladding at a first location thereon and re-couple said pump light into said amplifier cladding at a second location thereon, said first location being downstream of said second

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location in said propagation direction. [Fig. 19, #1903] [Col. 32, line 61 - Col. 33, line 24]

- Regarding claim 5, Nilsson discloses the apparatus of claim 4, wherein said recovery fiber is fused together with said amplifier fiber cladding at said first and second locations. [Fig. 19, #1904, #1902] [Col. 32, line 61 - Col. 33, line 24]
- Regarding claim 6, Nilsson discloses the apparatus of claim 1, wherein said optical arrangement includes at least one pump fiber. [Fig. 19, line connecting 1405 and 1408] [Col. 32, line 61 - Col. 33, line 24]
- Regarding claim 7 and 13, Nilsson discloses the apparatus of claim 5, [Fig. 19] [Col. 32, line 61 - Col. 33, line 24]
 - including M pump fibers [line connecting 1405 and 1408, M=1] and N recovery fibers [#1905, N=1] each of which having first and second ends,
 - wherein said first ends of said pump and recovery fibers are formed into a first composite fiber [#1902] which is coupled to an input end of said amplifying fiber [#1408], wherein said second ends of said pump and recovery fibers are formed into a second composite fiber [#1904] coupled to an output end of said amplifying fiber, [#1905]
 - and wherein pump light is inserted from said source thereof into said cladding via said M pump fibers [line connecting 1405 and 1408, M=1] and is received from said amplifier cladding and reinserted into said amplifier cladding via said N recovery fibers. [#1901]

- Regarding claim 8 and 14, Nilsson discloses the apparatus of claim 7, wherein said source of pump light includes M diode-laser emitters each thereof delivering light into a second end of a corresponding one of said M pump fibers. [Fig. 19, #1405 (where M=1)] [Col. 32, line 61 - Col. 33, line 24]
- Regarding claim 23, Nilsson discloses Optical apparatus, comprising:
 - an amplifier fiber having a doped core surrounded by a cladding, [Fig. 30, #2400] [Col. 37, lines 29 - 50]
 - said core doping providing optical gain for light propagating therein in a propagation direction when said doped core is energized by pump light absorbed therein; [Col. 37, lines 29 - 50]
 - a pump fiber, arranged to insert pump-light from a source thereof into said cladding of said amplifier fiber such that said pump light propagates through said cladding thereof in a first propagation direction; [Fig. 30, line connecting 1405 and 1408] [Col. 37, lines 29 - 50] and
 - a recovery fiber arranged to receive an unabsorbed portion of said propagated pump light from said cladding, and to re-insert said unabsorbed portion of said pump-light into said cladding for re-propagation therein in a second propagation direction opposite to said first propagation direction. [Fig. 30, #3008] [Col. 37, lines 29 - 50]
- Regarding claim 24, Nilsson discloses the optical apparatus of claim 23, wherein said recovery fiber is terminated by a mirror, and said unabsorbed pump light,

after reflection from said mirror is reinserted in said fiber cladding a location thereon at which it is received. [Fig. 30, #1901] [Col. 37, lines 29 - 50]

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

17. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson (Fig. 19) as applied to claims 1, 4-8, 13-14, and 23-24 above, and further in view of Nilsson (Fig. 5). In Fig. 19 Nilsson discloses the invention with all the limitations of claim 1, but fails to disclose the use of reflectors to form a laser cavity. Fig. 5 teaches the use of reflectors to form a laser cavity [Fig. 5b, #360] [Col. 8, lines 35-59]. Therefore, it would have been obvious to one skilled in the art (e.g. an optical engineer) at the time

the invention was made, to create a fiber amplifier with a feedback loop where the ends of the amplifying means were terminated with reflecting means, for the advantage of coherent light production.

18. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson as applied to claims 1, 4-8, 13-14, and 23-24 above, and further in view of Masters et al. (USP No. 3289101). Nilsson discloses the invention with all the limitations of claim 1, but fails to disclose evanescent coupling means where the recovery fiber is twisted around the amplification medium. Masters teaches optical pumping of an active medium, where the unused pump light is returned via a fiber which is twisted around the active medium [Fig. 13, #93] [Col. 8, lines 21-32]. Therefore, it would have been obvious to one skilled in the art (e.g. an optical engineer) at the time the invention was made, to create an optical amplifier with an active medium, wherein the pump light was introduced and returned via a pump/recovery fiber that was wrapped around the active fiber, for the advantage of eliminating undue deformation of the active fiber cladding, thereby increasing gain.

19. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson in as applied to claims 1, 4-8, 13-14, and 23-24 above. Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to change the number of pumping and recovery fibers suggested by Nilsson to achieve a desired result, this being the correct reintroduction of various modes back into the

amplification fiber, or providing the necessary number of pumping fibers corresponding to the number of pumping frequencies required by the amplification apparatus. It is well-settled that optimizing a result effective variable is well within the expected ability of a person of ordinary skill in the subject art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980), In re Aller, 220 F.2d 454, 105 USPQ 233 (CCPA 1955).

20. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson as applied to claims 1, 4-8, 13-14, and 23-24 above, and further in view of Hecht.

Nilsson discloses the invention with all the limitations of claim 7, but fails to disclose the use of multimode fibers. Hecht teaches that any fused coupler can support single- or multi-mode signals [Fig. 12.6] [Page 219]. Therefore, it would have been obvious to one skilled in the art (e.g. an optical engineer) at the time the invention was made, to create an optical amplifier using multimode fibers, for the advantage of carrying a WDM signal.

21. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson as applied to claims 1, 4-8, 13-14, and 23-24 above, and further in view of Hecht and Reinhardt. Nilsson discloses the invention with all the limitations of claim 7, but fails to disclose the pump/recovery fibers being coupled using spliced fiber coupling as well as tapering the fiber so that its diameter matched that of the amplifying fiber. Hecht teaches the equivalence of a WDM and a fused fiber coupler [Page 209-229]. Reinhardt teaches that attenuation occurs if the diameters are mismatched [Fig. 5.2.6] [Page 11]. Therefore, it would have been obvious to one skilled in the art (e.g. an optical engineer)

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at the time the invention was made, to create an Mx1 or a 1xN fused fiber coupler whose diameter tapered to that of the amplification fiber, for the advantage of having the same number of modes on both sides of the coupler.

22. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nilsson in view of Hecht and Reinhardt as applied to claim 11 above. Nilsson, Hecht and Reinhardt collectively disclose the invention with all the limitations of claim 11, and in addition Nilsson teaches an intermediary fiber between the coupler [Fig. 19, #1902] and active fiber [Fig. 19, #1408]. Therefore, it would have been obvious to one skilled in the art (e.g. an optical engineer) at the time the invention was made, to have an intermediary fiber between the coupler and active fiber, for the advantage of allowing a gradual reduction in size thereby conserving optical modes.

23. While patent drawings are not drawn to scale, relationships clearly shown in the drawings of a reference patent cannot be disregarded in determining the patentability of claims. See In re Mraz, 59 CCPA 866, 455 F.2d 1069, 173 USPQ 25 (1972).

Conclusion

24. The prior art which is cited but not relied upon is considered pertinent to applicant's disclosure.


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ari M. Diacou whose telephone number is (571) 272-5591. The examiner can normally be reached on Monday - Friday, 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AMD 9-7-2005


JACK KEITH
PRIMARY EXAMINER
SPE 3663